Analysis Approach for Water Quality Trends Under KBRA and KHSA Including Consideration of Klamath Basin TMDLs

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Background

Klamath River Secretarial Determination and EIS/EIR need to consider potential KHSA and KBRA impacts on water quality

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Klamath River Secretarial Determination and EIS/EIR need to consider potential KHSA and KBRA impacts on water quality

Seven existing and two draft TMDLs in the basin

TMDL adoption & implementation is expected to affect water quality during the analysis period

Background

KHSA, KBRA, TMDLs & NPS programs provide a broad outline for a water quality recovery strategy in the Klamath River Basin – how to analyze?

Project Framework

Secretarial Determination

- Proposed Action
  - KHSA - removal of all four dams
  - KBRA implementation
  - TMDLs/NPS
- No Action Alternative
  - TMDLs/NPS

EIS/EIR (NEPA/CEQA)

- Proposed Action
  - KHSA - removal of all four dams
  - KBRA implementation
  - TMDLs/NPS
- No Action Alternative
  - TMDLs /NPS
- Alternatives to the Proposed Action
  - Sequenced dam removal, sediment removal

Regulatory Environment

- Beneficial use designations and water quality narrative and numeric criteria
  - North Coast Regional Water Quality Control Board Basin Plan (2006a)
  - Hoopa Valley Tribe Environmental Protection Agency Water Quality Control Plan (2008)
  - Karuk Tribe, Resighini Rancheria, and Yurok Tribe narrative and numeric water quality objectives and criteria
  - Oregon Department of Environmental Quality OAR 340-41-0180, -0184, -0185

Regulatory Environment

- California TMDLs (NCRWQCB and USEPA)
  - Draft Klamath River (2010): water temperature, DO, nutrients, microcystin. Approved by NCRWQCB and SWRCB, awaiting approval from USEPA by December 31, 2010
  - Shasta River (2006b): water temperature and DO
  - Scott River (2006c): water temperature and sediment
  - Salmon River (2005): water temperature
  - Trinity River (2001): sediment
  - South Fork Trinity River (1998): sediment
  - Lower Lost River (2008): Final Technical TMDL for nutrients
- Oregon TMDLs (ODEQ)
  - Draft Upper Klamath and Lost River Subbasins TMDL and WQMP (2010): water temperature, DO, ammonia toxicity, pH, and chlorophyll-a. Public comment period closed May 27, 2010
  - Upper Klamath Lake Drainage TMDL and Water Quality Management Plan (WQMP) (2002)

Regulatory Environment

- FERC Relicensing Process
  - Permitting and environmental review for FERC Project No. 2082 licensing activities held in abeyance during KHSA Interim Period
  - Baseline Conditions do not include PacifiCorp Proposed Measures or FERC Staff Alternative with Mandatory Conditions under its Final License Application (2007)
  - Under the No Action Alternative, the FERC process will have to be re-visited and it is unknown what measures or 401 Certification actions will be required
- Biological Opinions
  - USFWS (2008): Operations of the Klamath Project
  - NMFS (2010): Coho salmon in the Klamath River

Analysis Approach

1. Identify and compile WQ-related actions under each program
   - Ecosystem attribute affected
   - WQ parameter affected
   - Basin location (spatial)
   - Anticipated timelines for project start and WQ improvements (temporal)
2. Synthesize a subset of example projects representing a reasonably foreseeable level of restoration effort under the Proposed Action and No Action Alternative
3. Develop conceptual-level WQ trajectories to predict WQ trends

1. KBRA: WQ-Related Actions

- Fisheries Program restoration projects
  - Aquatic habitat (in-stream)
  - Uplands
  - Keno Reservoir
- Fisheries Program monitoring projects
  - Indirect contribution to WQ improvements


Photo by Stillwater Sciences

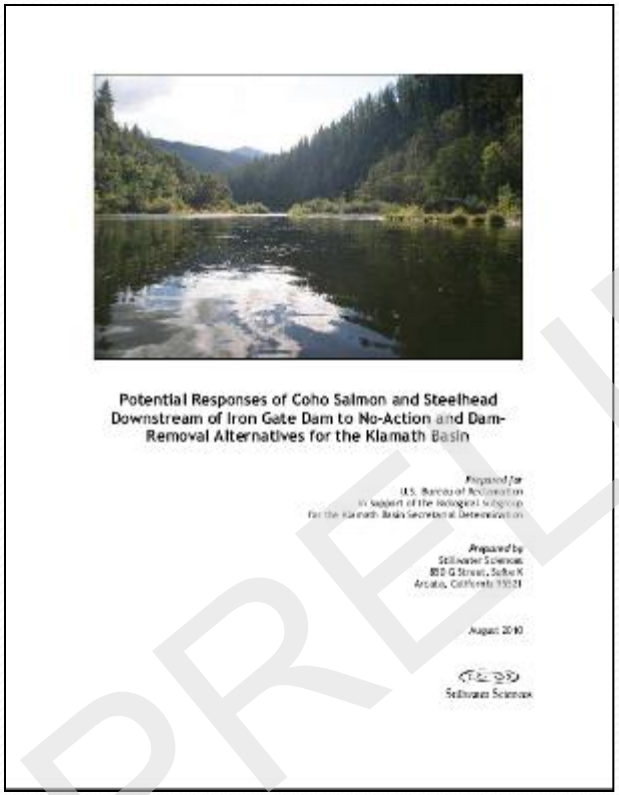
- Water Resources Program flow diversion and water management projects in upper basin

1. KBRA: WQ-Related Actions (cont.)

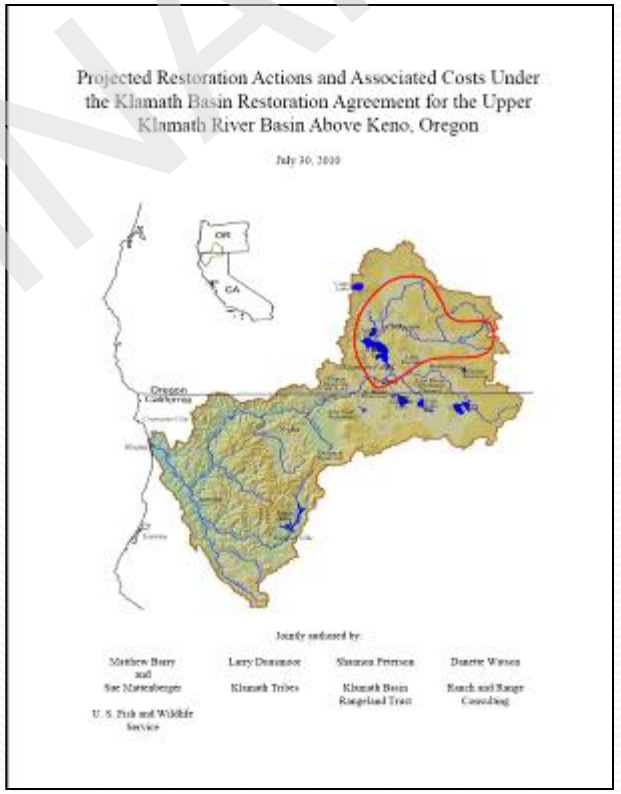
- Water Resources Program projects completed or underway:
  - TNC breached levees to restore Upper Klamath Lake storage capacity and reconnect the historic lake bed
  - Reconnection of Agency Lake and Barnes Ranches to Upper Klamath Lake by levy breaching
  - Reconnection of Wood River Wetland to Agency Lake

1. KBRA: WQ-Related Actions (cont.)

Existing sources for restoration project details:



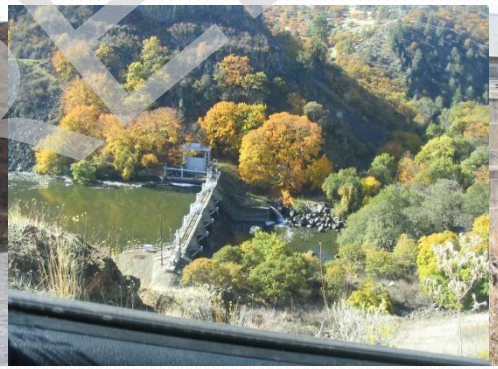
Stillwater Sciences (2010)



Barry et al. (2010)

1. KHSA: WQ-Related Actions (IMs)

- IM 3: Iron Gate Turbine Venting
- IM 5: Iron Gate Flow Variability
- IM 6: Fish Disease Relationship and Control Studies
- **IM 10: Water Quality Conference**
- **IM 11: Interim Water Quality Improvements**
- IM 13: Flow Releases and Ramp Rates
- IM 15: Water Quality Monitoring

1. TMDLs and NPS Restoration Projects

- Inter-agency MOUs and cooperative agreements
- Water quality management plans (incl. agriculture)
- Water quality restoration plans
- Land use and management plans (LRMPs)
- Ag waivers
- Timber harvest plans
- Forest plan agency implementation of BMPs
- Others…

2. Synthesize Set of Example Projects

- Example projects will primarily affect water temperature, DO, and nutrients (TN, TP)
- Water temperature
  - quantitative modeling (HEC5Q) results
  - requires qualitative inclusion of TMDL effects (currently under development)
- DO and nutrients
  - identify projects by location
  - conceptual-level trajectory development

2. Synthesize Set of Example Projects (cont.)

Proposed Action - Williamson River at Chiloquin (upstream tributary to Upper Klamath Lake)

- TNC wetland restoration (location TBD)
- Klamath WQ Tracking and Accounting Program (in development)
- *Implementation of projects such as*
  - treatment wetlands (location TBD)
  - engineered ambient treatment system (e.g., at the 7-mile Canal)
- TMDL Non-Point Source BMP Implementation Program
- KBRA sediment source immobilization (location TBD)

2. Synthesize Set of Example Projects (cont.)

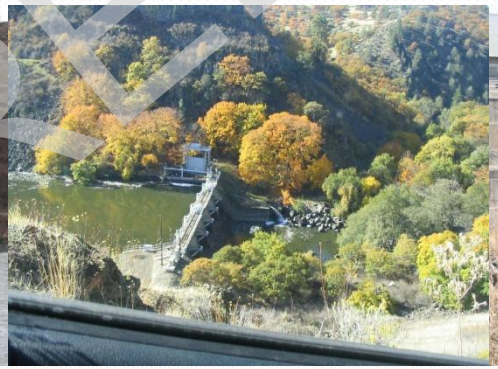
Proposed Action
Upper Klamath Lake at Link River Dam

- TNC wetland restoration at Williamson River Delta and Barnes Ranch
- Klamath WQ Tracking and Accounting Program (in development)
- *Implementation of projects such as*
  - treatment wetlands (location TBD)
  - engineered ambient treatment system (location TBD)
- KBRA sediment source immobilization (location TBD)

2. Synthesize Set of Example Projects (cont.)

Proposed Action
Link River at Keno Dam (includes Lower Lost River)

- Klamath WQ Tracking and Accounting Program (in development)
- *Implementation of projects such as*
  - engineered ambient treatment system (e.g., at the Klamath Straits Drain)
- KBRA upland treatment wetlands (location TBD)

2. Synthesize Set of Example Projects (cont.)

Proposed Action
Klamath River at Iron Gate Dam

- KBRA/ Klamath WQ Tracking and Accounting Program (in development)
- *Implementation of projects such as*
  - Treatment wetlands (e.g., associated with footprints of JC Boyle and Copco I reservoirs)

2007. Picture by Yantao Cui, Stillwater Sciences.

2. Synthesize Set of Example Projects (cont.)

Proposed Action
Klamath River at Turwar

- TMDL Non-Point Source BMP Implementation Program
- CA Non-Point Source Waiver Program


February 2009. Photo by Micah Gibson (YTEP)

2. Synthesize Set of Example Projects (cont.)

No Action Alternative
All Locations

- *Reduced scale and delayed implementation of projects such as*
  - treatment wetlands (location TBD)
  - engineered ambient treatment system
- While no projects are currently proposed in the Project Reach, PacifiCorp is obligated to submit an Implementation Plan to achieve TMDL allocations and targets during winter 2010-2011 (NCRWQCB 2010)

3. Conceptual-level WQ trajectories

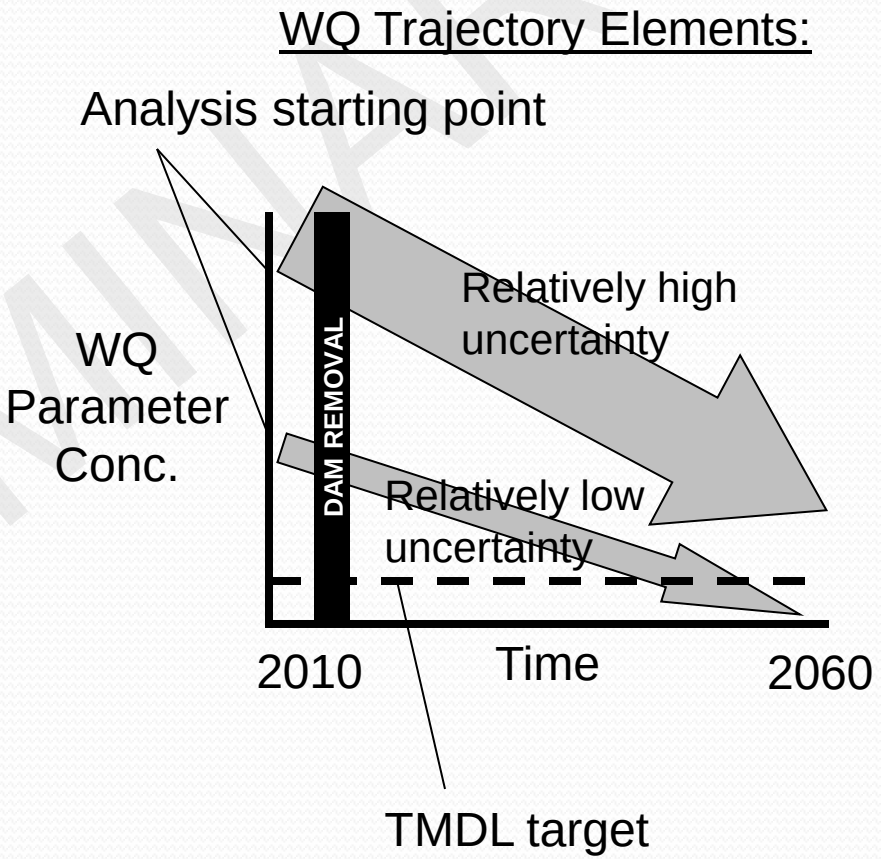
- Comparison
  - Proposed Action – KHSA + KBRA + TMDLs/NPS
  - No Action Alternative –TMDLs/NPS
- Analysis starting point is WQ data collected by USBR, USFWS, PacifiCorp, Klamath Tribes, Karuk Tribe, and Yurok Tribe
- For No Action Alternative, nutrient trajectory assumes continued annual nutrient retention in Iron Gate, Copco I and II, and JC Boyle reservoirs (Asarian et al., 2009)

3. Conceptual-level WQ trajectories (cont.)

- Given currently available water quality improvement tools (i.e., example projects) trajectories represent expected trends in nutrients.
  - Proposed Action water quality projections come close or meet the TMDL target
  - No Action Alternative projections do not meet the TMDL target
- The TMDL is an adaptive management process.
- If target is not met, agencies would be obligated to find other projects to help meet the targets, though not necessarily by 2062.

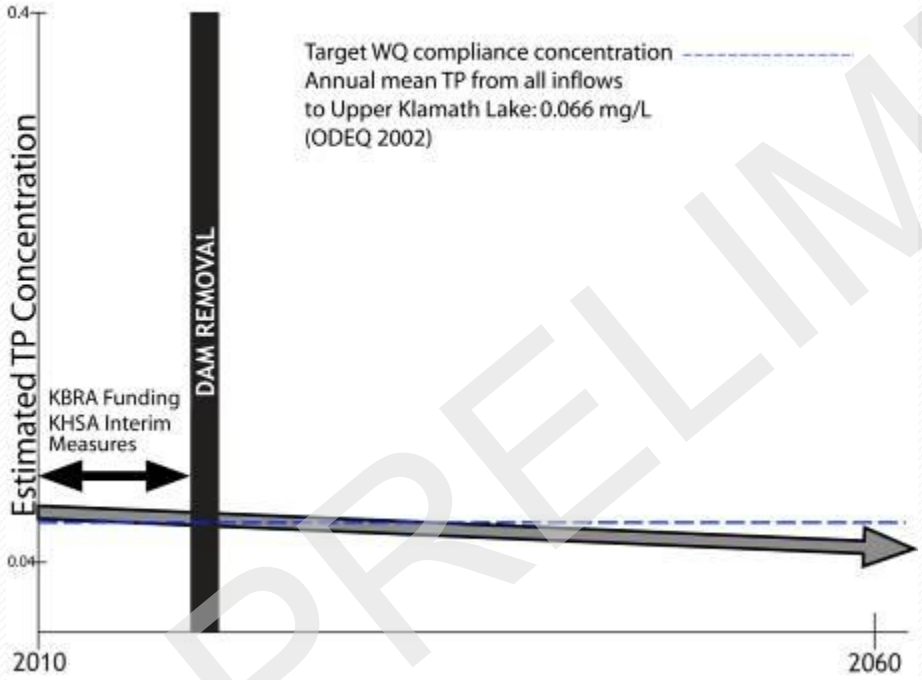
3. Conceptual-level WQ trajectories (cont.)

- Anticipated effects on WQ indicated by differences in Proposed Action/No Action end-point of arrows (i.e., 2062)
- Uncertainty in trajectory estimates varies by location and is indicated by arrow thickness (i.e., thicker arrow means greater uncertainty)
- TMDL targets are identified by basin location



3. Conceptual-level WQ trajectories - nutrients

TP



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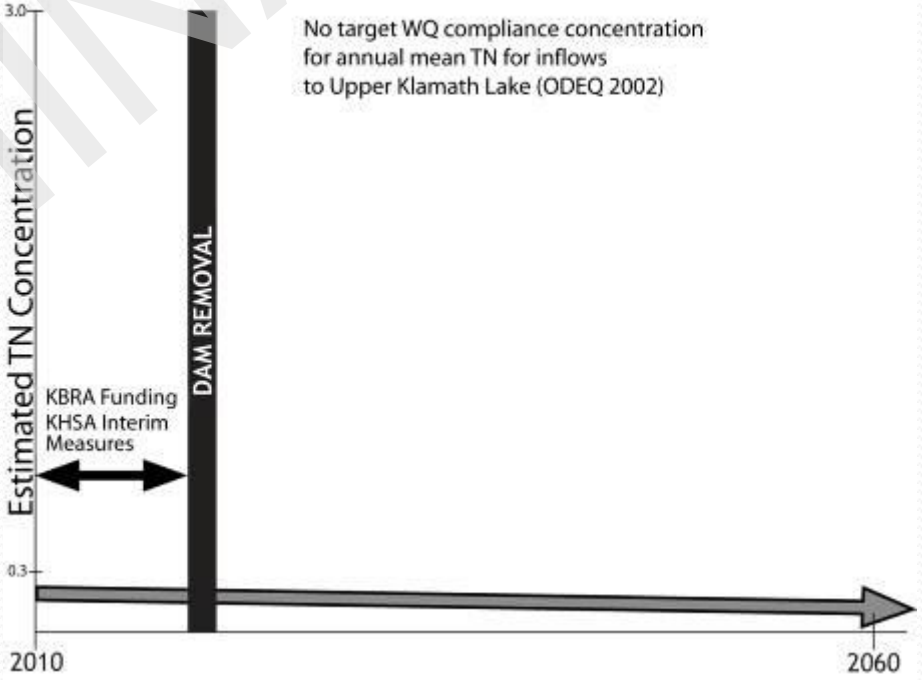

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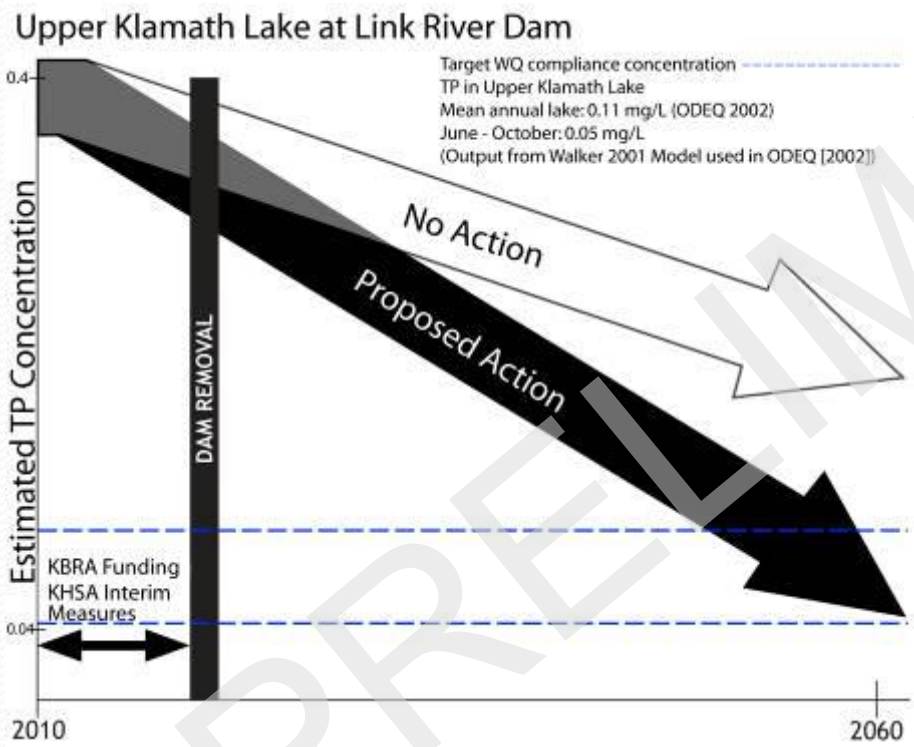

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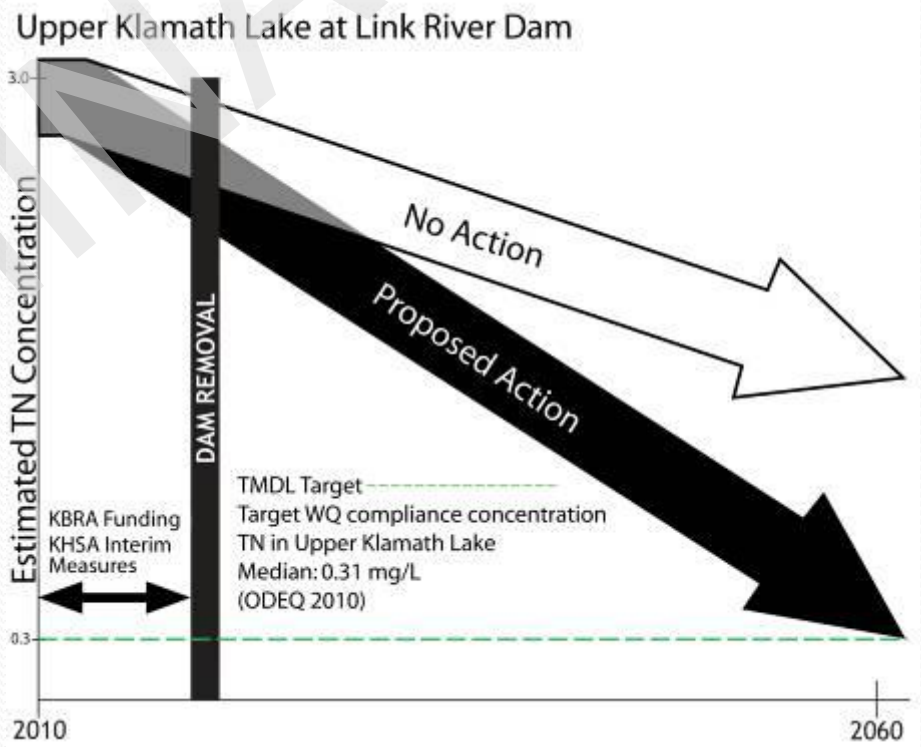

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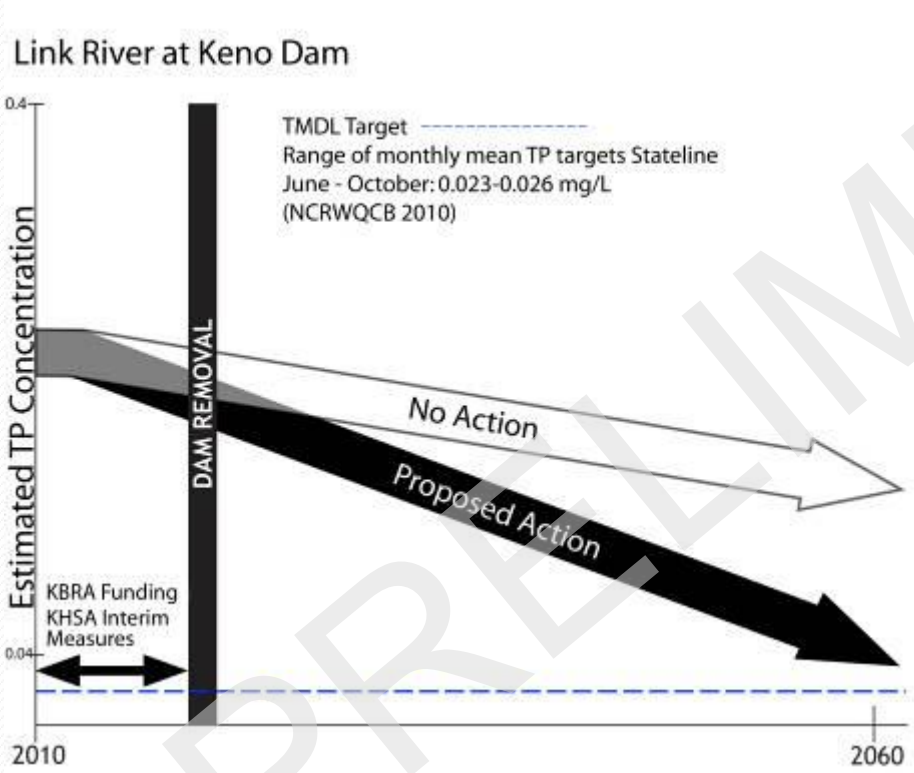

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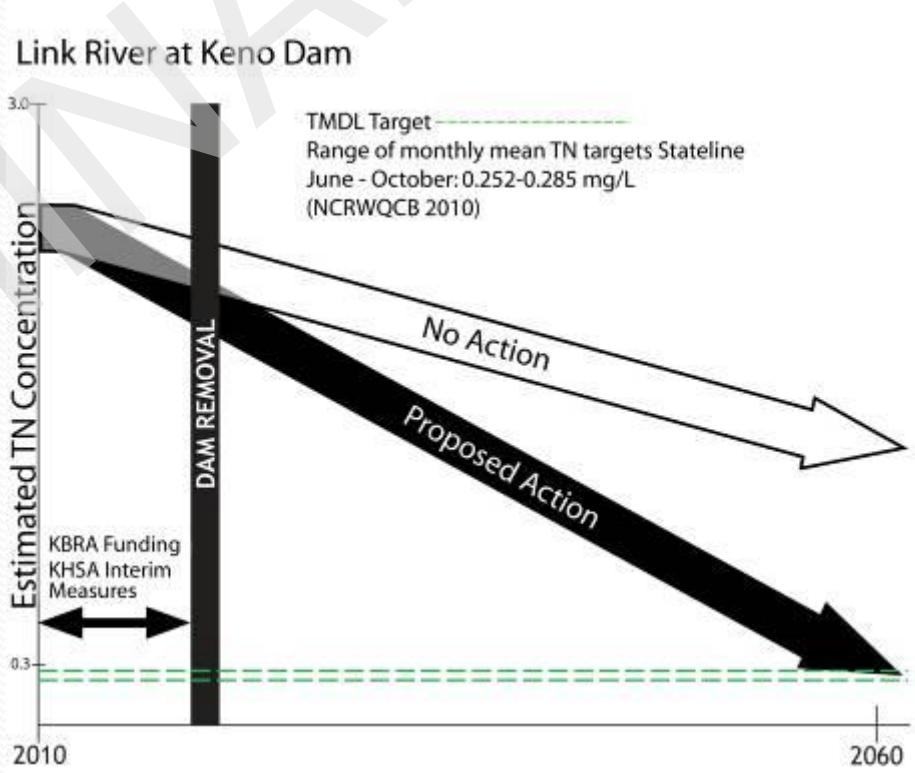

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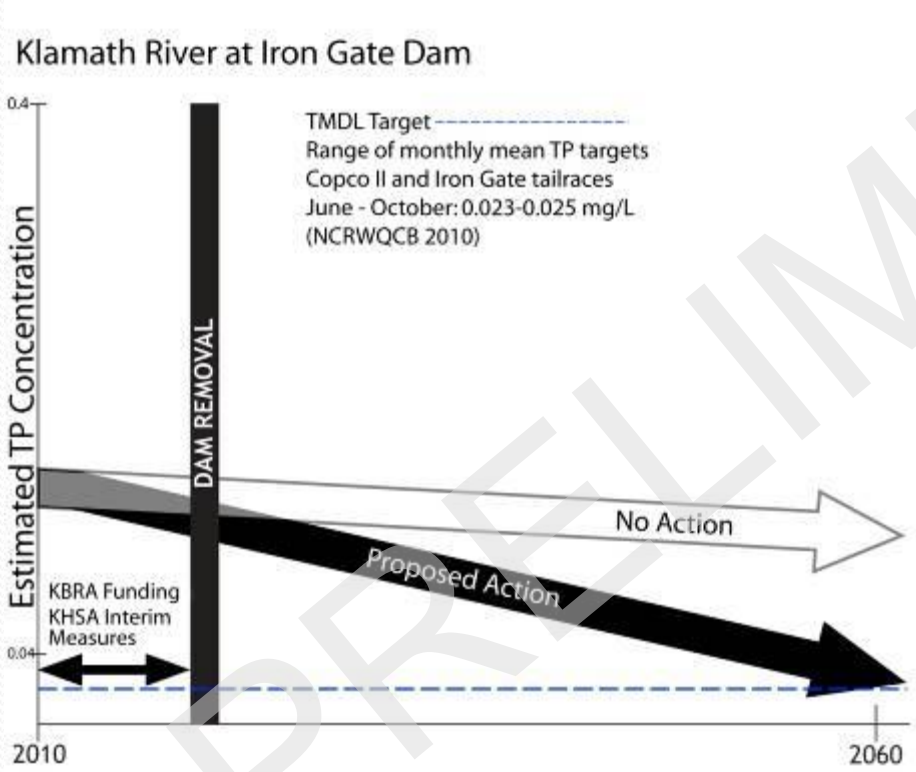

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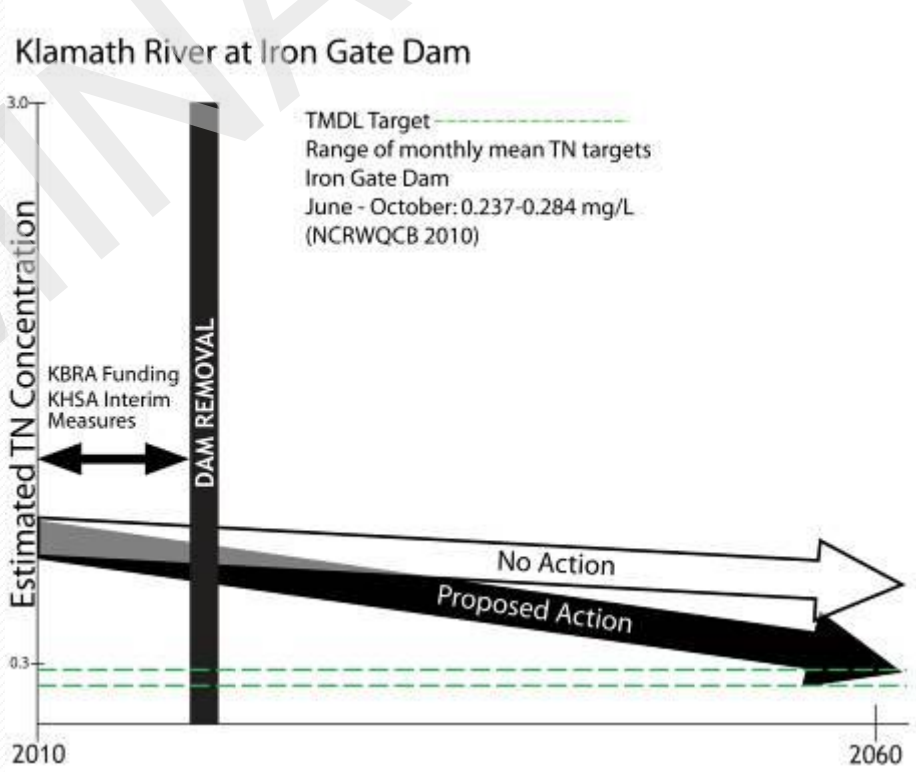

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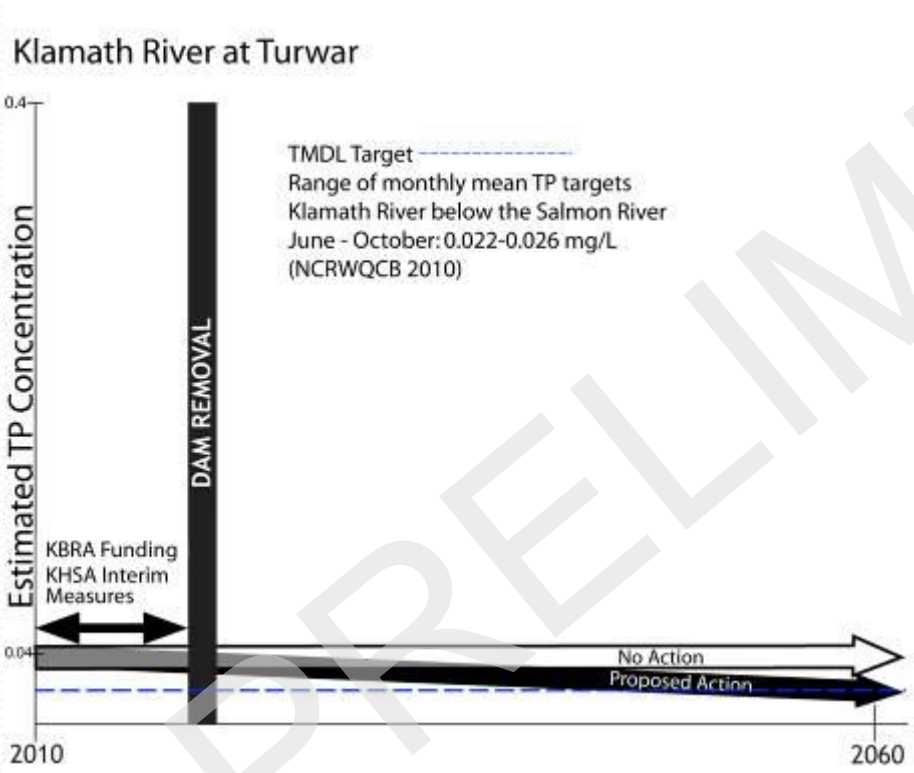

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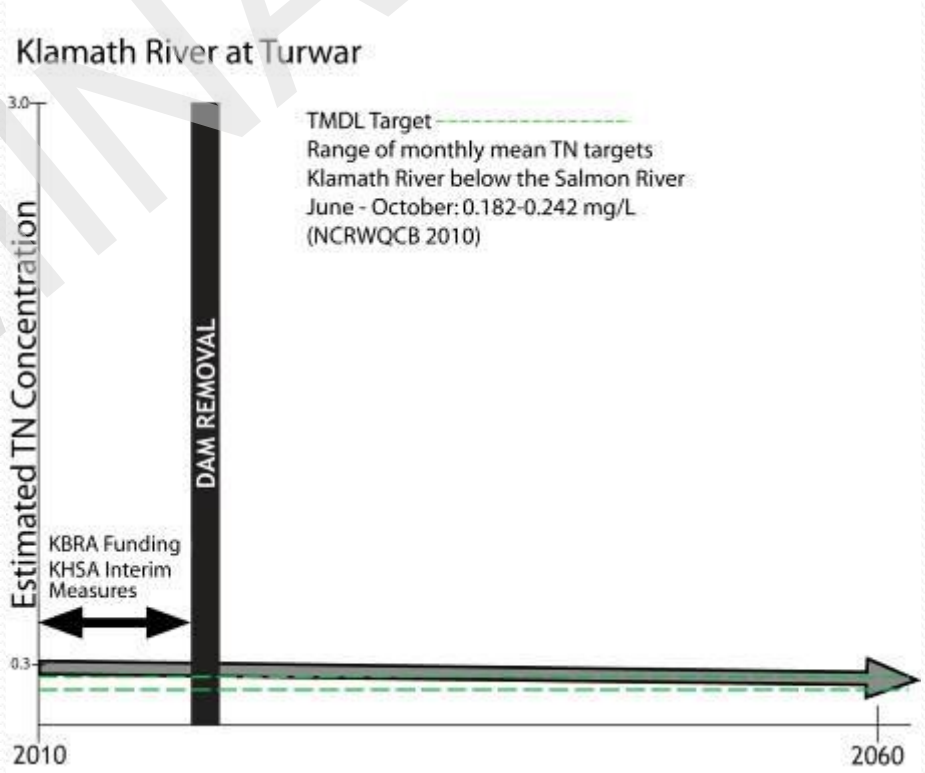

Summary and Next Steps

- Proposed Action accelerates achievement or near achievement of TMDL targets as compared with No Action Alternative
- Greater absolute difference between Proposed Action and No Action Alternative in 2062 for Upper Klamath Lake and Link River/Keno Dam locations
- Greater uncertainty in projections for Upper Klamath Lake and Link River/Keno Dam locations
  - WQ restoration within Upper Klamath Lake and Link River/Keno Dam locations is critical to success of Klamath Basin restoration
  - Ongoing scientific investigations needed to inform control strategy for the legacy pollutant load in lakebed sediments
- Planning, feasibility analyses, and pilot studies currently underway as part of KHSA IMs 10 and 11 may in result in an altered set of example projects

Next Steps

- Finalize and sub-team review compilation of WQ-related actions under each program
- Present DO conceptual-level trajectories
- Present water temp conceptual-level analysis of TMDL effects following updated HEC5Q model results
- Incorporate feedback from ongoing TMDL process to refine and optimize the list of example projects